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Application of Mesenchymal stem cells for therapeutic agent delivery in anti-tumor treatment

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Abstract

© 2018 Chulpanova, Kitaeva, Tazetdinova, James, Rizvanov and Solovyeva. Mesenchymal stem cells (MSCs) are non-hematopoietic progenitor cells, which can be isolated from different types of tissues including bone marrow, adipose tissue, tooth pulp, and placenta/umbilical cord blood. There isolation from adult tissues circumvents the ethical concerns of working with embryonic or fetal stem cells, whilst still providing cells capable of differentiating into various cell lineages, such as adipocytes, osteocytes and chondrocytes. An important feature of MSCs is the low immunogenicity due to the lack of co-stimulatory molecules expression, meaning there is no need for immunosuppression during allogenic transplantation. The tropism of MSCs to damaged tissues and tumor sites makes them a promising vector for therapeutic agent delivery to tumors and metastatic niches. MSCs can be genetically modified by virus vectors to encode tumor suppressor genes, immunomodulating cytokines and their combinations, other therapeutic approaches include MSCs priming/loading with chemotherapeutic drugs or nanoparticles. MSCs derived membrane microvesicles (MVs), which play an important role in intercellular communication, are also considered as a new therapeutic agent and drug delivery vector. Recruited by the tumor, MSCs can exhibit both pro- and anti-oncogenic properties. In this regard, for the development of new methods for cancer therapy using MSCs, a deeper understanding of the molecular and cellular interactions between MSCs and the tumor microenvironment is necessary. In this review, we discuss MSC and tumor interaction mechanisms and review the new therapeutic strategies using MSCs and MSCs derived MVs for cancer treatment.

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Keywords

Chemotherapy resistance, Cytokines, Membrane vesicles, Mesenchymal stem cells, Oncolytic viruses, Suppressor genes, Tumor microenvironment

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